

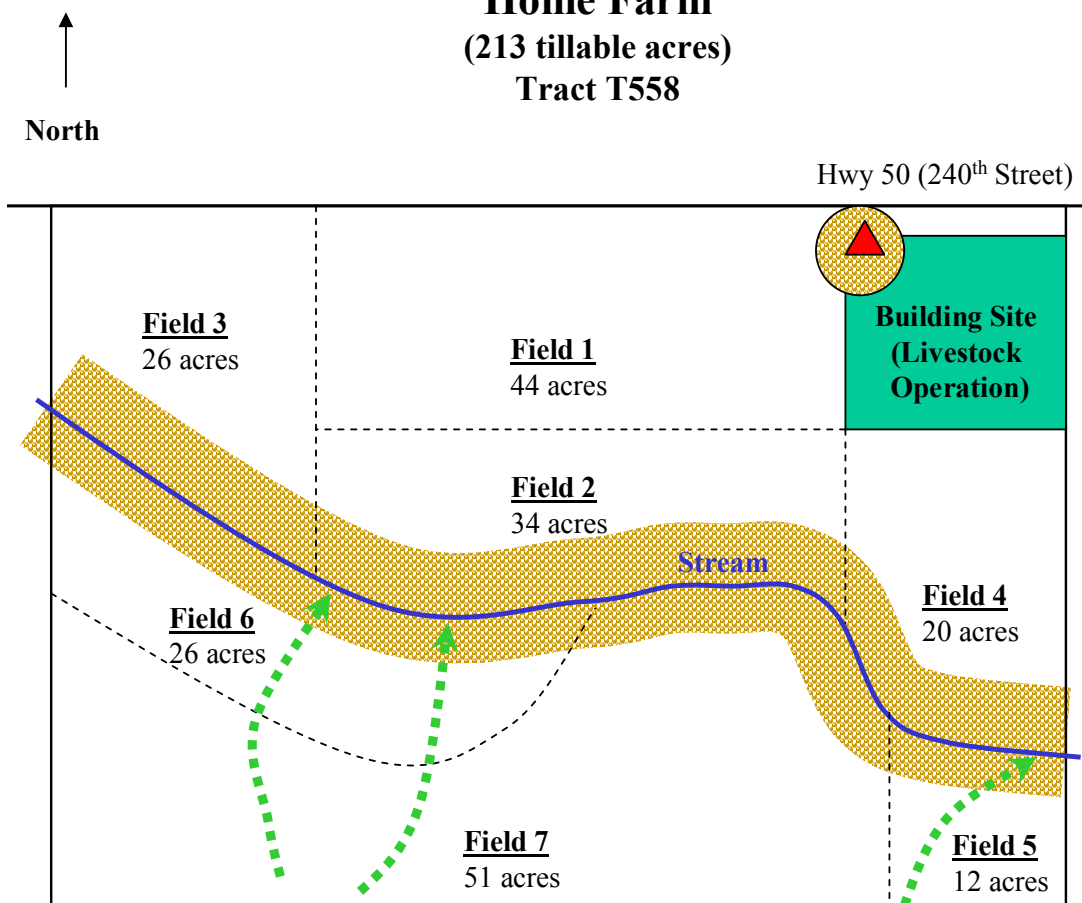
## **BASELINE NUTRIENT MANAGEMENT PLAN**

# Sample Plan



**Joe Farmer  
Any Address, MN 55555  
(000) 000-000**

# Joe Farmer Home Farm (213 tillable acres) Tract T558



Any County  
Any Township  
Section 14, NW 1/4

Scale: 1 inch = 620 feet

Fields to receive manure applications  
during rotation(s)  
Fields: **All**

Fields to receive winter-time manure  
applications during rotation(s)  
Fields: **None**

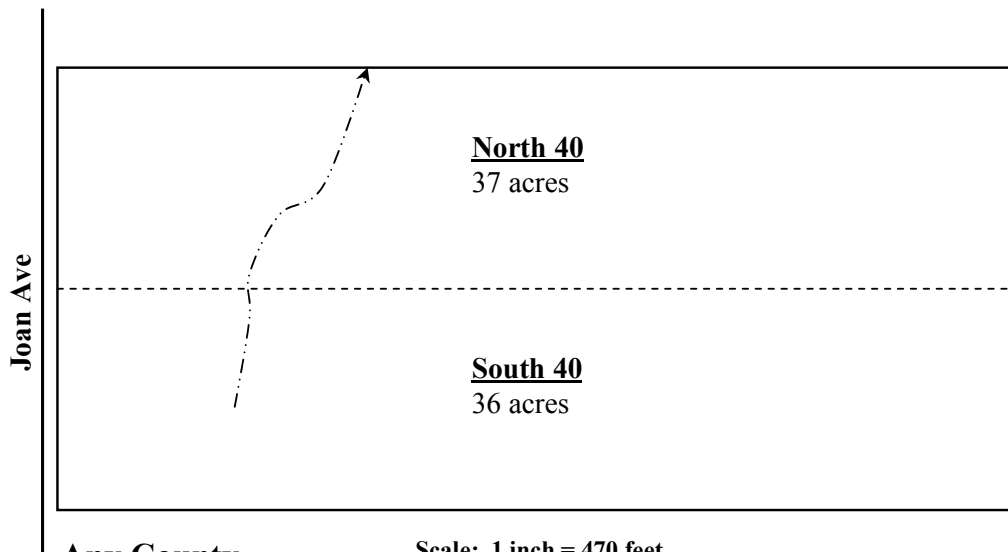
Fields with 6% or greater slopes  
Fields: **None**

## Sensitive Areas

Stream	
Waterway	
Tile Inlet	
Water Well	
Special Protection Area	



**Joe Farmer  
Ricke Farm  
(73 tillable acres)  
T1157**



**Any County  
Any Township  
Section 20, NW 1/4**

Scale: 1 inch = 470 feet

**Fields to receive manure applications  
during rotation(s)**

**Fields: All**

**Fields to receive winter-time manure  
applications during rotation(s)**

**Fields: None**

**Fields with 6% or greater slopes**

**Fields: None**

**Sensitive Areas**

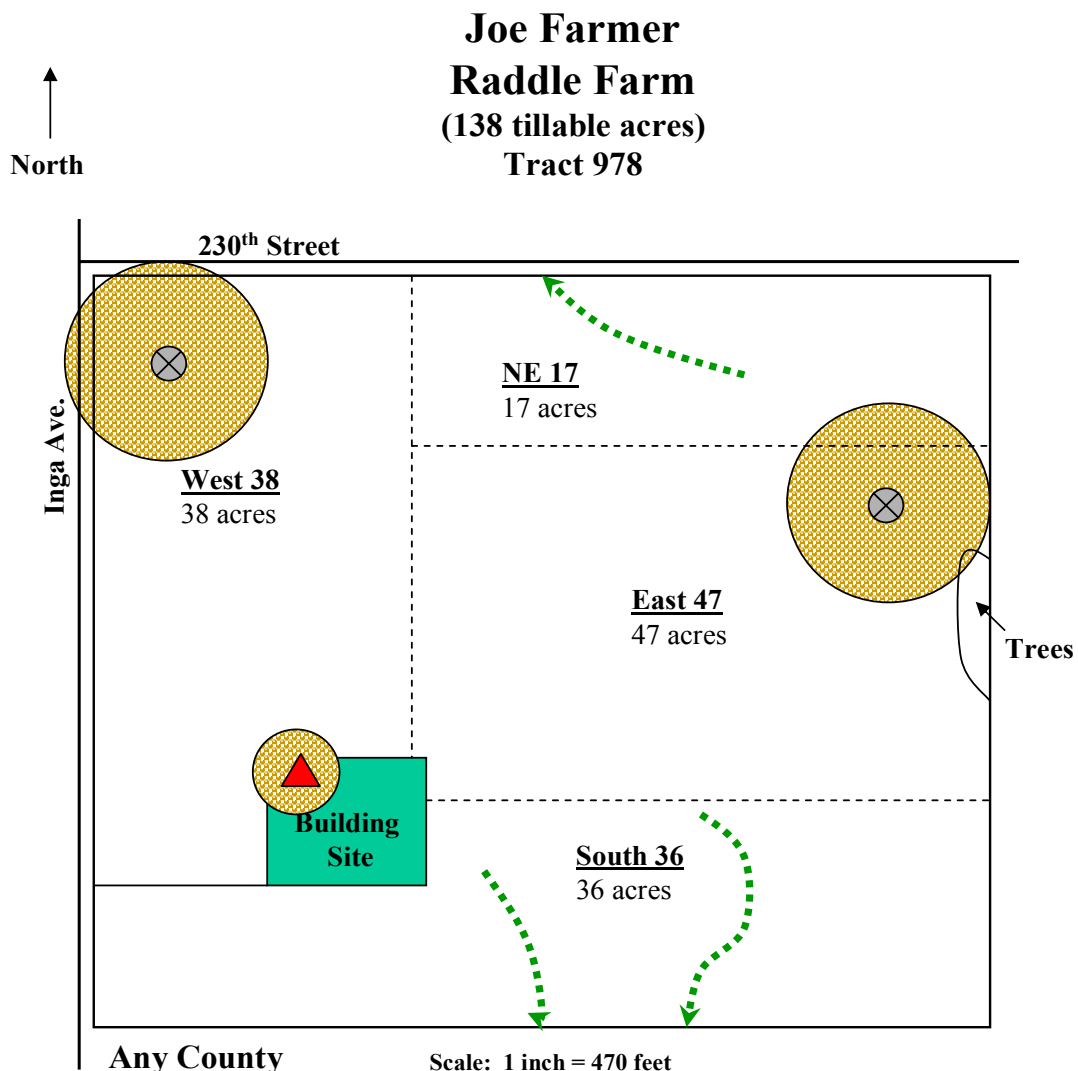
**Stream**

**Waterway**

**Tile Inlet**

**Water Well**

**Special  
Protection Area**



Fields to receive manure applications during rotation(s)

Fields: **All**

Fields to receive winter-time manure applications during rotation(s)

Fields: **None**

Fields with 6% or greater slopes

Fields: **S36**

### Sensitive Areas

Stream



Waterway



Tile Inlet



Water Well



Special

Protection Area



**BASELINE NUTRIENT MANAGEMENT PLAN (Version 2.1)**  
**(Meets Requirements of USDA-NRCS Programs and Minnesota State 7020 Feedlot Rules)**

**Joe Farmer**

Any Street  
Any City, MN 55555  
(000) 000-0000

**This plan provides information to help handle, test and land apply nutrients in a manner that benefits plant, soil, water, air, and other resources. The plan provides general nutrient rate recommendations that may need adjusting when subsequent annual field specific nutrient plans are developed.**

**This Baseline Nutrient Management Plan includes field maps and information on:**

- ✓ Existing storage structures, runoff controls and other production area structures
- ✓ Available cropland acres and acres needed for manure application (minimum acres calculation)
- ✓ Sensitive areas requiring special management
- ✓ Existing and Planned sensitive area management
- ✓ Existing and Planned Operation and maintenance activities
- ✓ Recommended general nutrient application rates
- ✓ Appendices

**I. LIVESTOCK; MANURE STORAGE, HANDLING AND TESTING; AND  
TOTAL NUTRIENTS FROM LIVESTOCK**

The appended “**Manure Storage, Handling and Testing**” report contains information about the type of livestock; the quantity of manure produced annually by those livestock; your storage systems; and your manure testing practices, spreader calibration procedures and application methods. Manure quantity, if estimated, does not include bedding, wash-water or lot runoff water.

The appended “**Manure Nutrient Supply**” report lists total nutrients available to plants in the year of application from a year’s supply of manure as: The estimates account for nutrient losses in storage and during application.

N	29891 lbs.	P <sub>2</sub> O <sub>5</sub>	23529 lbs.	K <sub>2</sub> O	19143 lbs.
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**II. AVAILABLE CROPLAND ACRES AND ACRES NEEDED FOR MANURE APPLICATION**

The appended “**Crop Nutrient Demand**” report indicates you have 424 acres in a rotation of corn/soybeans. The rotational average nutrient demand of these crops is shown below and is based on: Univ. of Minnesota nitrogen recommendations for row crops (deducts N supplied by soil and previous legumes); N removal rates for legume crops; and P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O removal rates for all crops and forages.

Total demand	N	62752 lbs.	P <sub>2</sub> O <sub>5</sub>	20564 lbs.	K <sub>2</sub> O	17172 lbs.
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The appended “**Nutrient Summary**” report indicates acres needed to utilize these nutrients

N	202 acres	P <sub>2</sub> O <sub>5</sub>	485 acres	K <sub>2</sub> O	473 acres
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The acreage estimates for N assume that manure is applied to legumes at removal rates. You will need more acres than indicated to utilize manure N if you limit manure applications to non-legume crops or restrict applications on legume crops.

**III. FIELDS WITH SENSITIVE AREAS REQUIRING SPECIAL MANAGEMENT**

**Sensitive Features and Areas**

Your fields may contain sensitive features and/or areas requiring special management. Sensitive features increase the potential for pathogenic organisms or applied nitrogen and phosphorus to move towards ground water or surface waters. Elevated levels of nitrogen in drinking water can cause illness or even death in babies and young livestock. Scientific trials show direct relationships between soil test phosphorus (STP) levels and soluble algal available phosphorus in runoff. The higher the soil phosphorus levels, the greater the potential to

accelerate algae growth if a field's runoff reaches surface waters. Additionally, it takes many years to reduce STP levels once they have climbed to extremely high levels.

Sensitive areas are zones where natural factors increase the potential for degradation of natural resources including water quality. The potential for degradation can be minimized or eliminated by understanding and accounting for these factors when planning nutrient applications. Your fields containing sensitive features and areas are:

Soil Test P > 21B or >75 B	Coarse Texture Soils	Slope > 6%	Lake, Stream Wetland<300'	Water-way or Ditch	Open Tile Intake <300'	Water Supply Well <300'
<b>2</b>	<b>1,4</b>		<b>6,7</b>	<b>2,3,4,5,6,7</b>	<b>5,6,7</b>	<b>1</b>
		<b>N40,S40</b>			<b>N40,S40</b>	
<b>S36</b>				<b>N17, S36</b>	<b>E47,W38</b>	<b>W38</b>

Many of these features as well as roads in proximity to your fields have been shown on your plan maps.

### **Nitrogen and Phosphorus Loss**

The general sensitivity of the farm to timing of commercial fertilizer nitrogen applications has been determined based on soil texture in your fields and annual rainfall amounts. Additional factors used in this evaluation include: (None). Based on this evaluation, nitrogen transport and loss potentials are **High** for fall applications, **Moderate** for spring preplant applications and **Low** for sidedress or split applications. Field specific loss ratings can be found on the appended "**Field Nitrogen Loss Assessment**" report.

The general sensitivity of the farm to phosphorus transport has been determined based on current soil test P levels, soil loss levels and distance to receiving waters. Additional factors used in this evaluation include: (None). Based on this evaluation, phosphorus transport and loss potentials are **Moderate**. Field specific loss ratings can be found on the appended "**Field Phosphorus Loss Assessment**" report.

## **IV. RECOMMENDED PRACTICES FOR SENSITIVE AREAS AND FEATURES**

### **Soil and Water Conservation Practices**

The following soil and water conservation practices are recommended to reduce soil loss and in some cases filter runoff on sensitive fields receiving manure applications. The practices will keep sheet and rill soil losses below 6 tons/acre/year. Soil and water conservation practices needed to keep soil losses at 2-4 tons/acre/year and allow additional manure application flexibility have not been listed.

PRACTICE	FIELDS	INSTALL YEAR
<input checked="" type="checkbox"/> Mulch tillage	1,4,7,South 36, North 40, South 40	2001
<input type="checkbox"/> Contouring		
<input type="checkbox"/> Contour Strip-Cropping		
<input type="checkbox"/> Grass/hay in rotation		
<input type="checkbox"/> Terraces		
<input checked="" type="checkbox"/> Filter Strips	2,4	2004

Consult your **Soil and Water Conservation Plan** for additional detail.

### **Applications within Vulnerable Public Drinking Water Supply Management Areas**

Fields receiving manure or commercial nitrogen fertilizer **are not** located within a public drinking water supply management area that has been classified as vulnerable to contamination. As a result, the "**Management Practice Considerations for Nitrogen and Phosphorus**" report **has not** been included to provide nitrogen management practice recommendations for those vulnerable areas.

### **Winter-time Manure Applications**

Fields included in this plan **will not** be receiving wintertime manure applications to frozen or snow-covered surfaces and **are not** identified on the attached aerial photos or maps. It is recommended that manure applications during the winter months be made to the flattest fields that are the furthest distance from surface water. Do not apply manure on actively thawing surfaces. Do not apply solid manure on fields with greater than 4

tons/acre/year soil losses. Do not apply liquid manure applications on fields with greater than 2 tons/acre/year soil losses.

### **Summer-time Manure Applications**

Fields that are either fallow or the crop has been harvested **will not** be receiving manure applications during June, July or August. These fields **are not** identified on the attached aerial photos or maps. Fields receiving manure applications in the summer must have a crop actively growing or a cover crop must be established following early harvested crops. The following cover crops will be established on fields receiving summer-time manure applications: None

### **High Soil Phosphorus Levels**

You should manage your operation to avoid excessive build-up of soil test phosphorus (STP). Your baseline plan and subsequent annual plans may not recommend manure applications on some fields because of very high STP levels. In general, plan the rate and frequency of manure applications to avoid STP buildup to 75 ppm as Bray P1. Cease applications before STP levels reach 150 ppm (300 lbs./ac.) as Bray P1. The following manure application frequencies should be implemented as a phosphorus strategy for either building or maintaining or reducing STP levels.

<b>Manure Application Frequency</b>	<b>List of Fields</b>
Application every four years	1,4
Application every three years	2, Raddle S 36
Application every two years	All other fields

If STP levels continue to rise, two final options are available: 1.) find additional acres for manure applications and/or 2.) change rations to reduce the amount of nutrients excreted by livestock. At your request “**Livestock Ration Self-Assessment**” worksheets” **have not** been included in the appendices to this plan.

### **Additional Practices**

The attached report “**Management Practice Considerations in Sensitive Fields**” lists additional practices to use in sensitive area. Other reports on nutrient application restrictions or recommended management practices **have not** been included in the appendices to this plan.

## **V. OPERATION AND MAINTENANCE**

### **1. Operation**

- The Operation and Maintenance plan for your system's manure storage, treatment, and transfer components should be carefully read, particularly concerning toxic gasses and fumes in confined locations; required fencing around ponds and periodic inspections of system components.
- The storage structure(s) should be emptied as shown below and as appropriate should be properly agitated prior to pumping to dislodge settled solids from the bottom and insure adequate nutrient mixing. Man hours required to empty the facility and apply manure to your fields is also indicated below.
- Test manure once per year. This frequency can be reduced after three years if analyses show consistent results overtime or between pump-out or scraping periods. Always retest following changes in manure storage and handling, livestock types or livestock feed. Your planned manure testing frequencies are listed in the table below. Manure samples will be collected and handled according to Univ. of Minn. guidelines (UMES bulletin FO-6423-GO Livestock Manure Sampling) and analyzed by a Minnesota Department of Agriculture (MDA) certified laboratory.

<b>Storage Facility</b>	<b>Number of Times and planned months to Empty Per Year</b>	<b>Manure Sampling Frequency</b>	<b>Annual Hours required to empty facility</b>
Building 1- underground liquid	2 (Apr. and Nov.)	Semi-annually	50
Building 2-underground liquid	1 (Apr.)	Annually	50

- Soils should be sampled for organic matter, pH, phosphorus and potassium on each field at least once every 4 years. Testing for residual soil nitrate should be done annually where appropriate. Sampling and testing for soil nitrate **are not** being planned as a crop N use strategy for this operation. Soil samples will be collected

and handled according to Univ. of Minn. or NRCS guidelines (USDA-NRCS-MN Fact Sheet MN-NUTR3 Soil Sampling) and analyzed by a Minnesota Department of Agriculture (MDA) certified laboratory.

Planned Soil Sampling		Planned Calibration Years	
Fields	Year	Manure	Fertilizer
Home Farm-all fields	2002	2003	2003
Raddle Farm-all fields	2003	2003	2003
Ricke Farm-all fields	2004	2003	2003

- Commercial fertilizer and manure application equipment will be maintained and calibrated according to manufacturer directions and MN. Dept. of Agriculture and Univ. of Minn. guidelines (MDA Fact Sheet **Maintaining Anhydrous Ammonia Equipment** and UMES fact sheet **Calibrating Manure Spreaders**). Equipment will be maintained to insure that applied rates do not deviate from planned rates by more than approximately 15%.
- Apply manure in a uniform pattern that delivers the specified amount across the entirety of the planned area. Application method and incorporation timing will also be uniform across the planning area.
- Use safety practices to minimize exposure to manure gases and organic wastes and chemical fertilizers- particularly ammonia forms of fertilizers (MN. Dept. of Ag. Fact Sheets **Minnesota Ammonia Rules Revised** and **Anhydrous Ammonia Quick Checklist**). Wear protective clothing including footwear, a respirator, and gloves when appropriate.
- Protect fertilizer storage areas from weather to minimize runoff, leakage, and loss of material.
- Consider identifying fields (areas) for emergency wintertime or growing-season manure applications.

## 2. Maintenance

Maintain application equipment in good operating condition and clean after nutrient applications.

## 3. Record keeping - Maintain records for a six-year period.

At your request, record keeping forms **have** been included in this plan.

### Farm specific records

- Quantity of manure and other organic by-products produced.
- Dates and amount of manure removed from the system due to feeding, energy production, or export from the operation.
- Carcass disposal techniques
- Quantity and location of manure transported off-site to land not owned or controlled by you.

### Field specific records

- Name and address of commercial hauler or applicator receiving manure.
- Crop yields, planting and harvest dates and crop residues removed.
- Type of nutrient applied to each field (commercial fertilizer, manure, other nutrient source) and analysis of the nutrient.
- Application dates and rates, including application methods and time to incorporation.

## 4. Plan Review

This baseline plan should be reviewed annually and updated as necessary.

## VI. ROTATIONAL CROP NUTRIENT MANAGEMENT PLAN

Your **Rotational Crop Nutrient Management Plan** recommends manure and fertilizer application methods, timing and rates. The recommendations take into consideration potential for loss of nitrogen and/or phosphorus to air, runoff and leaching and are based on realistic yield goals, soil tests, manure analyses (average values if not available) and University of Minnesota fertilizer guidelines.

The recommendations are for each crop in your rotation; are grouped by similar fields and are only guides to help develop field specific annual nutrient management plans. Two recommendations are given: one recommendation without manure and one recommendation considering manure. This is because in a given year you may not have enough manure to cover all fields. The recommendations are not valid if any of the following occur. 1.) Manure is not regularly sampled and analyzed. 2.) Application equipment is not regularly calibrated for the recommended rates. 3.) More manure is applied in one part of a target area than in another part even though the same rate is recommended for the entire area (application rate and method is not uniform).



Fields	Crop/ Previous Crop(s)	Manure and Fertilizer				Fertilizer Only	
		Manure		Fertilizer		Form	Rate
		Rate	Timing	Form	Rate		
Home 1,4	Corn/Soybeans	not recommended				Urea Spring	250 lbs/ac
						7-21-7 Planting	5 gal/ac
Home 2,3,5,6,7	Corn/Soybean	3500 gal./ac	Fall-Knife Inject	7-21-7	5 gal/ac	Urea - Spring	250 lbs/ac
						7-21-7 Planting	5 gal/ac
Raddle E, NE, So. W	Corn/Soybean	4000 gal./ac	Spring-Broadcast-inc 12-96 hrs.	7-21-7	10 gal/ac	Urea Spring	250 lbs/ac
						7-21-7 Planting	10 gal/ac
Ricke Farm N and S 40	Corn/Soybean	4000 gal./ac	Fall-Knife Inject	7-21-7	5 gal/ac.	9-23-30 Fall	200 lbs/ac
						Urea Spring	300 lbs/ac
All Fields	Soybeans/corn	None		None		None	

## VII. ANNUAL FIELD SPECIFIC CROP NUTRIENT MANAGEMENT PLAN

The rotational plan shown above along with sensitive area practices should be reviewed and adjusted as necessary when developing annual field specific crop nutrient management plans.

Practice	Fields	Install Year
Crop Nutrient Management	Home Farm-all fields	2003
Crop Nutrient Management	Raddle Farm-all fields	2004
Crop Nutrient Management	Ricke Farm-all fields	2004

***This plan complies with USDA-Natural Resources Conservation Service of Minnesota standards and any applicable federal or state regulation in place as of the date shown below. Additional practices may be necessary to comply with local regulations. This plan was developed based on the current crop and animal production practices of the farm operation. Changes in those production practices could result in the need for modifying and updating of this plan.***

\_\_\_\_\_  
NRCS Certified Nutrient Specialist planner signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Specialist Name

\_\_\_\_\_  
TSP I.D. # or Agency Staff Title

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
Phone Number

\_\_\_\_\_  
City / State / Zip Code

## Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
<b>Home T558</b>		
1	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
2	Surface water within 300 feet No effective filter strip Soil phosphorus test levels 21-75 ppm (Bray) or 16-60 ppm (Olsen) Sheet and rill soil losses <= 6 tons/acre/year	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)  Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Base manure applications on P2O5 removal (MN State Requirement)  Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged
3	Surface water within 300 feet No effective filter strip Soil phosphorus test levels <21 ppm (Bray) or < 16 ppm (Olsen) Sheet and rill soil losses <= 6 tons/acre/year  Road ditches	Do not apply manure within 25 feet of surface water (MN State Requirement) Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)  Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Do not apply manure directly into road ditches (MN State Requirement)  Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement) Installation of appropriate filter strip next to surface water is encouraged

## Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
4	<p>Surface water within 300 feet</p> <p>No effective filter strip</p> <p>Soil phosphorus test levels 76-150 ppm (Bray) or 61-120 ppm (Olsen)</p> <p>Sheet and rill soil losses &lt; 4 tons/acre/year</p>	<p>Do not apply manure within 25 feet of surface water (MN State Requirement)</p> <p>Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)</p> <p>Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)</p> <p>Base manure applications on P2O5 removal (MN State Requirement)</p> <p>If applying manure from an operation with more than 300 animal units, the owner must apply for an interim permit and submit a manure management plan that includes phosphorous management to minimize risk to surface water. (MN State Requirement)</p> <p>Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)</p> <p>Installation of appropriate filter strip next to surface water is encouraged</p>
5	<p>Surface water within 300 feet</p> <p>No effective filter strip</p> <p>Soil phosphorus test levels &lt;21 ppm (Bray) or &lt; 16 ppm (Olsen)</p> <p>Sheet and rill soil losses &lt;= 6 tons/acre/year</p> <p>Established waterways, ditches and other water conveyances</p>	<p>Do not apply manure within 25 feet of surface water (MN State Requirement)</p> <p>Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)</p> <p>Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)</p> <p>Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)</p> <p>Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)</p> <p>Installation of appropriate filter strip next to surface water is encouraged</p>

## Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
6	<p>Surface water within 300 feet</p> <p>No effective filter strip</p> <p>Soil phosphorus test levels &lt;21 ppm (Bray) or &lt; 16 ppm (Olsen)</p> <p>Sheet and rill soil losses &lt;= 6 tons/acre/year</p> <p>Established waterways, ditches and other water conveyances</p>	<p>Do not apply manure within 25 feet of surface water (MN State Requirement)</p> <p>Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)</p> <p>Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)</p> <p>Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)</p> <p>Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)</p> <p>Installation of appropriate filter strip next to surface water is encouraged</p>
7	<p>Surface water within 300 feet</p> <p>No effective filter strip</p> <p>Soil phosphorus test levels &lt;21 ppm (Bray) or &lt; 16 ppm (Olsen)</p> <p>Sheet and rill soil losses &lt;= 6 tons/acre/year</p> <p>Established waterways, ditches and other water conveyances</p>	<p>Do not apply manure within 25 feet of surface water (MN State Requirement)</p> <p>Inject or incorporate manure within 24 hours if applied within 300 feet of surface water (MN State Requirement)</p> <p>Do not apply manure within 300 feet of surface water when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement)</p> <p>Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)</p> <p>Do not apply commercial nitrogen or phosphorous fertilizer when soils are frozen or snow-covered or actively thawing (winter) (NRCS-MN Program Requirement)</p> <p>Installation of appropriate filter strip next to surface water is encouraged</p>

## Management Practice Considerations in Sensitive Fields

Farm/Field	Sensitive Features and Conditions	Management Practices
<b>Raddle T978</b>		
East 47	Open (Surface) tile intakes	Do not apply manure within 300 feet open tile inlets when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Within 300 feet of open tile inlets, inject or incorporate manure within 24 hours (MN State Requirement)
NE 17	Road ditches Established waterways, ditches and other water conveyances	Do not apply manure directly into road ditches (MN State Requirement) Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
South 36	Road ditches Established waterways, ditches and other water conveyances	Do not apply manure directly into road ditches (MN State Requirement) Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
West 38	Open (Surface) tile intakes Road ditches	Do not apply manure within 300 feet open tile inlets when soils are frozen or snow-covered or actively thawing (winter) (MN State Requirement) Within 300 feet of open tile inlets, inject or incorporate manure within 24 hours (MN State Requirement) Do not apply manure directly into road ditches (MN State Requirement)

**Management Practice Considerations in Sensitive Fields**

<b>Farm/Field</b>	<b>Sensitive Features and Conditions</b>	<b>Management Practices</b>
<b>Ricke T1157</b>		
North 40	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Coarse textured soils	In fall, delay manure applications until daily average soil temperatures at a 6 inch depth are below 50 degrees F. (NRCS-MN Program Requirement) In fall, avoid liquid manure applications when possible In fall, do not apply commercial nitrogen fertilizer (NRCS-MN Program Requirement) Use sidedress or split applications of commercial nitrogen fertilizer
South 40	Road ditches	Do not apply manure directly into road ditches (MN State Requirement)
	Established waterways, ditches and other water conveyances	Do not apply manure directly into waterway, ditch or other water conveyance system (NRCS-MN Program Requirement)
	Coarse textured soils	In fall, delay manure applications until daily average soil temperatures at a 6 inch depth are below 50 degrees F. (NRCS-MN Program Requirement) In fall, avoid liquid manure applications when possible In fall, do not apply commercial nitrogen fertilizer (NRCS-MN Program Requirement) Use sidedress or split applications of commercial nitrogen fertilizer

# APPENDICES

(Design documents and recordkeeping)

Page

## Evaluations

NRCS Minnesota Field Nitrogen Loss Assessment	<input checked="" type="checkbox"/> 1
NRCS Minnesota Field Phosphorus Loss Assessment	<input checked="" type="checkbox"/> 2
Field specific Soil Loss estimates	<input type="checkbox"/>
Livestock Ration Self-Assessment	<input type="checkbox"/>

## General Information

Lists of Required Permits if any	<input type="checkbox"/>
General Farm Field Information	<input checked="" type="checkbox"/> 3
Crop Information	<input checked="" type="checkbox"/> 4
“Nutrient Application Restrictions in Sensitive Areas” Report	<input type="checkbox"/>
“Management Practice Considerations for Nitrogen and Phosphorus” Report	<input type="checkbox"/>

## Soils Information

Soil Maps and Soil Legends	<input checked="" type="checkbox"/> 5
Soil Information Report from “Nutrient Management Planner for Minnesota”	<input checked="" type="checkbox"/> 8
Soil Test Reports	<input type="checkbox"/>
Cropping History and Soil Fertility Inventory (optional NRCS form MN-CPA-41)	<input type="checkbox"/>

## Manure Information

Manure Information Inventory (optional NRCS form MN-CPA-42)	<input type="checkbox"/>
Nutrient Management Practices Inventory (optional NRCS form MN-CPA-43)	<input type="checkbox"/>
Manure Storage, Handling and Testing Report	<input checked="" type="checkbox"/> 9
Manure Nutrient Supply Report	<input checked="" type="checkbox"/> 10
Crop Nutrient Demand Report	<input checked="" type="checkbox"/> 11
Nutrient Summary Report	<input checked="" type="checkbox"/> 12
Manure Test Results	<input type="checkbox"/>
1 <sup>st</sup> Year Nutrient Availability in Pounds per Acre (optional report identifying available manure nutrients from different rates and application methods)	<input type="checkbox"/>
Manure Spreader Calibration Worksheets	<input checked="" type="checkbox"/> 13

## Rotational Nutrient Budget

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## Fact Sheets and Guidesheets

NRCS Fact Sheet MN-NUTR3-Soil Sampling	<input checked="" type="checkbox"/> 15
NRCS Fact Sheet MN-NUTR6- Manure Sampling and Analysis	<input checked="" type="checkbox"/> 17
UMES fact sheet “Calibrating Manure Spreaders	<input type="checkbox"/>

## Recordkeeping Forms

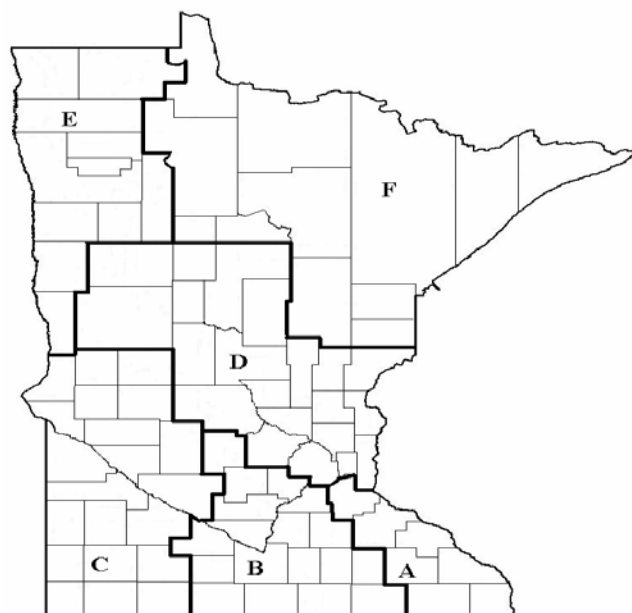
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## FIELD NITROGEN LOSS ASSESSMENT

**Table 1: Long Term Annual Relative Nitrogen Loss Potential<sup>1</sup>**

Zone	Application Method	Soil Texture		
		Coarse <sup>2</sup>	Medium	Fine
A	Fall	VH	H	M
	Spring preplant	H	M	M
	Sidedress or split	M	L	L
B	Fall	VH	M	M
	Spring preplant	H	L	L
	Sidedress or split <sup>3</sup>	M	L	L
C,D	Fall	VH	L	L
	Spring preplant	H	L	L
	Sidedress or split <sup>3</sup>	M	L	L
E	Fall	M	L	L
	Spring preplant	L	L	L
	Sidedress or split <sup>3</sup>	L	L	L
F	Fall	H	L	L
	Spring preplant	M	L	L
	Sidedress or split <sup>3</sup>	M	L	L

**Figure 1: Nitrogen Loss Zones**



<sup>1</sup>Potential Rating: VH-Very High, H-High, M-Moderate, L-Low.

<sup>2</sup>Coarse-textured soils apply to the surface soil texture and/or the subsoil texture within three feet of the surface. These textures include sand, loamy sand, loamy coarse sand, fine sand, loamy fine sand, loamy very fine sand, coarse sand, very fine sand, and any of the above listed textures with gravelly or very gravelly modifiers.

<sup>3</sup> If applied after June 15, the loss rating is reduced to Low on Coarse textured soils. However, late nitrogen applications on most soils that are followed by conditions that reduce yield (i.e. below average precipitation) can cause nitrogen loss to occur due to the crop not utilizing the applied nitrogen. To reduce the potential for this to occur on corn ground, apply no later than the 8th leaf stage.

**PRODUCER: Joe Farmer**

**FARM: Home T558, Raddle T978, Ricke T1157**

**MAP ZONE OR LOCATION: A**

FIELD	APPLICATION METHOD	SOIL TEXTURE	RATING
Home 2	Spring preplant	Medium	Moderate
Home 3	Spring preplant	Medium	Moderate
Home 4	Spring preplant	Medium	Moderate
Home 6	Sidedress or split	Medium	Low
Raddle NE 17	Sidedress or split	Medium	Low
Raddle West 38	Spring preplant	Medium	Moderate
Ricke North 40	Sidedress or split	Coarse	Moderate

When ratings are M or higher select management options from UMES' Regional Nitrogen Best Management Practices. Please note that the management option of most importance in Zone A and on coarse textured soils statewide is eliminating fall application of commercial N fertilizers.



## FIELD PHOSPHORUS LOSS ASSESSMENT

**Manure applications are not recommended when ephemeral erosion is not controlled.**

Distance to Surface Water (feet)	Effective 100 ft. Filter Strip	Soil Test Phosphorous (STP) Levels (ppm)		Sheet and Rill Erosion (Tons/Acre/Year)	Base Manure Application Rate on:
		Bray P1	Olsen		
NA	NA	NA	NA	> 6	No Application
< 300	No	≤ 21	≤ 16	< 6	Nitrogen Needs
		22 - 75	17 - 60	< 6	P <sub>2</sub> O <sub>5</sub> Removal
		76 - 150	61 - 120	< 4	P <sub>2</sub> O <sub>5</sub> Removal
				4 - 6	No Application
	Yes	> 150	>120	< 6	No Application
		≤ 21	≤ 16	< 6	Nitrogen Needs
		22 - 75	17 - 60	< 4	Nitrogen Needs
				4 - 6	P <sub>2</sub> O <sub>5</sub> Removal
		76 - 150	61 - 120	< 6	P <sub>2</sub> O <sub>5</sub> Removal
		> 150	>120	≤ 2	P <sub>2</sub> O <sub>5</sub> Removal
				> 2	No Application
		No	No	< 6	Nitrogen Needs
				< 6	P <sub>2</sub> O <sub>5</sub> Removal
				< 4	P <sub>2</sub> O <sub>5</sub> Removal
				> 4	No Application
≥ 300	No	≤ 76	≤ 61	< 6	Nitrogen Needs
		76 - 150	61 - 120	< 6	P <sub>2</sub> O <sub>5</sub> Removal
		> 150	> 120	< 4	P <sub>2</sub> O <sub>5</sub> Removal
	Yes	≤ 150	≤ 120	< 6	Nitrogen Needs
				< 4	Nitrogen Needs
		>150	>120	4 - 6	P <sub>2</sub> O <sub>5</sub> Removal

PRODUCER: Joe Farmer

FARM: Home, T558, Raddle T978, Ricke T1157

FIELD	DISTANCE TO WATER	FILTER STRIP	STP LEVEL	SOIL LOSSES	RECOMMENDATION
Home1	greater than 300 ft	No	78B ppm	5.5 ton	P2O5 Removal
Home 2	less than 300 ft	No	23B ppm	4 ton	P2O5 Removal
Home3	less than 300 ft	No	17B ppm	4.8 ton	Nitrogen Needs
Home4	less than 300 ft	No	82B ppm	3.9 ton	P2O5 Removal
Home 5	less than 300 ft	No	17B ppm	5 ton	Nitrogen Needs
Home 6	less than 300 ft	No	14B ppm	4 ton	Nitrogen Needs
Home 7	less than 300 ft	No	19B ppm	4 ton	Nitrogen Needs
Raddle E. 47	greater than 300 ft	No	17B ppm	6 ton	Nitrogen Needs
Raddle NE 17	greater than 300 ft	No	14B ppm	6 ton	Nitrogen Needs
Raddle S. 36	greater than 300 ft	No	23B ppm	5 ton	Nitrogen Needs
Raddle W 38	greater than 300 ft	No	19B ppm	6 ton	Nitrogen Needs
Ricke N. 40	greater than 300 ft	No	14B ppm	6 ton	Nitrogen Needs
Ricke S. 40	greater than 300 ft	No	17B ppm	6 ton	Nitrogen Needs

**General Farm Field Information**

<b>Field</b>	<b>Acres</b>	<b>Irrigated</b>	<b>Location/Description</b>
<b>Home T558</b>			
1	44.0		Dakota County, Hampton Twp, Section 14, NW1/4
2	34.0		Hampton Twp, Section 14, NW 1/4
3	26.0		Hampton Twp, Section 14, NW1/4
4	20.0		Hampton Twp, Section 14, NE 1/4
5	12.0		Hampton Twp, Section 14, NE 1/4
6	26.0		Hampton Twp, Section 14, NW 1/4
7	51.0		Hampton Twp, Section 14, NW 1/4
<b>Raddle T978</b>			
East 47	47.0		Dakota County, Douglas Twp, Section 7, NW 1/4
NE 17	17.0		Douglas Twp, Section 7, NW 1/4
South 36	36.0		Douglas Twp, Section 7, NW 1/4
West 38	38.0		Douglas Twp, Section 7, NW 1/4
<b>Ricke T1157</b>			
North 40	36.0		Dakota County, Douglas Twp, Section 20, NW 1/4
South 40	37.0		Douglas Twp, Section 20, NW 1/4
<b>Total Acres</b>	<b>424.0</b>		

Operator/Producer Joe Farmer

Planning Year 2002

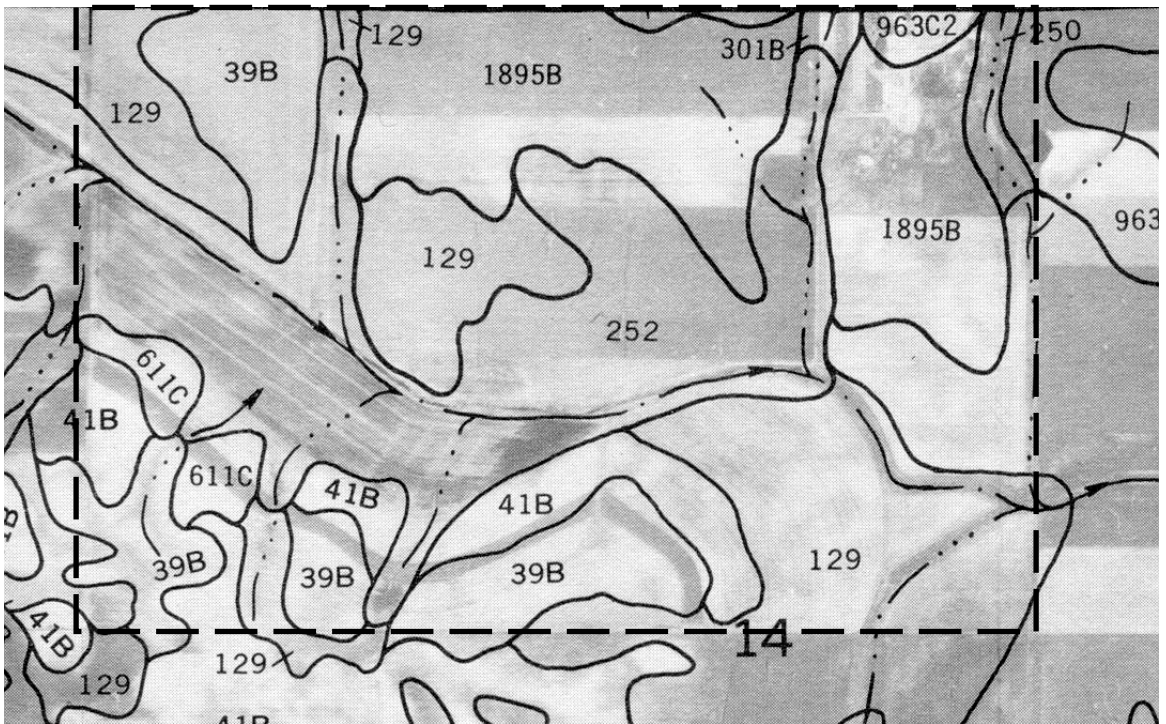
Date Printed Jan 29, 2002

## Crop Information

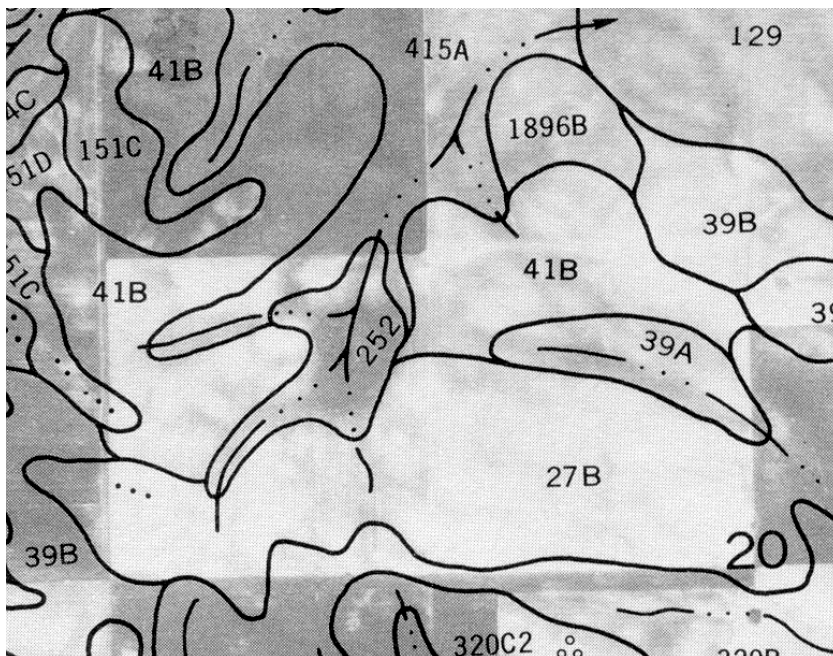
Field	Acres	Planning Year		Last Year		Other Previous Years					
		2002		2001		2000		1999		1998	
		Crop	Yield Goal	Crop	Yield	Crop	Yield	Crop	Yield	Crop	Yield
Home T558											
1	44	soybeans	50	corn	169	soybeans	54				
2	34	corn	165	soybeans	45	corn	171				
3	26	corn	160	soybeans	49	corn	162				
4	20	corn	160	soybeans	49	corn	178				
5	12	soybeans	50	corn	168	soybeans	46				
6	26	corn	165	soybeans	47	corn	172				
7	51	soybeans	50	corn	155	soybeans	47				
Raddle T978											
East 47	47	soybeans	50	corn	180	soybeans	53				
NE 17	17	corn	160	soybeans	48	corn	159				
South 36	36	soybeans	50	corn	174	soybeans	53				
West 38	38	corn	160	soybeans	51	corn	167				
Ricke T1157											
North 40	36	corn	160	corn	0						
South 40	37	soybeans	45	corn	0						

## Soil Maps

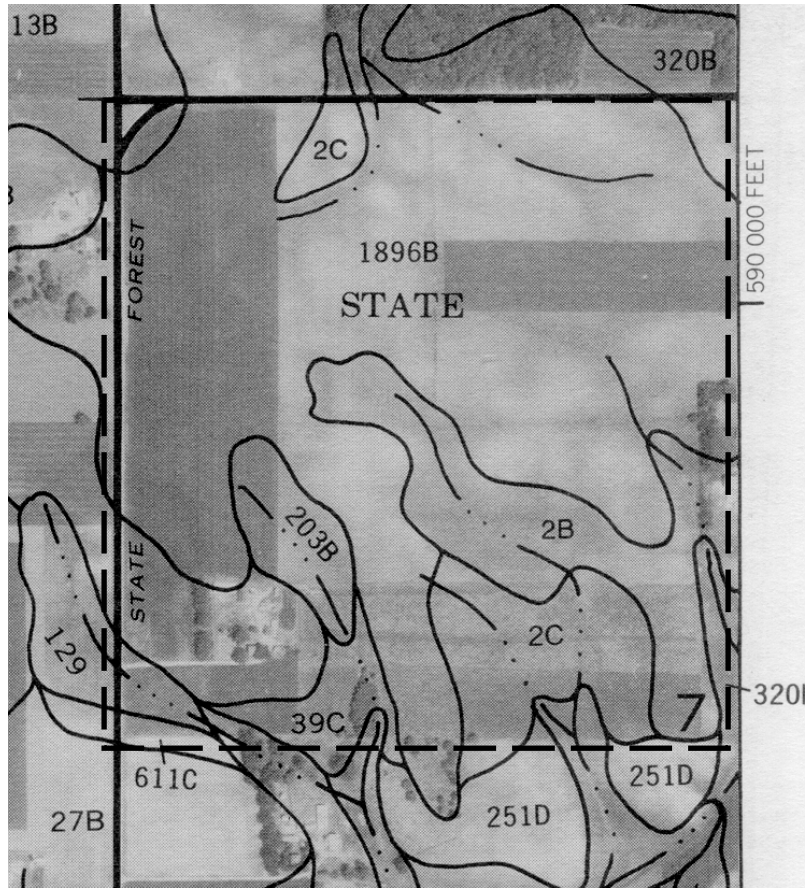
## Home Farm (213 tillable acres)



## Ricke Farm (73 tillable acres)



**Raddle Farm (138 acres)**





## SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is eroded.

SYMBOL	NAME	SYMBOL	NAME
2B	Ostrander loam, 1 to 6 percent slopes	320C2	Tallula silt loam, 6 to 12 percent slopes, eroded
2C	Ostrander loam, 6 to 12 percent slopes	342B	Kingsley sandy loam, 3 to 8 percent slopes
7A	Hubbard loamy sand, 0 to 1 percent slopes	342C	Kingsley sandy loam, 8 to 15 percent slopes
7B	Hubbard loamy sand, 1 to 6 percent slopes	342E	Kingsley sandy loam, 15 to 25 percent slopes
7C	Hubbard loamy sand, 6 to 12 percent slopes	342F	Kingsley sandy loam, 25 to 40 percent slopes
7D	Hubbard loamy sand, 12 to 18 percent slopes	344	Quam silt loam
8A	Sparta loamy fine sand, 0 to 1 percent slopes	377B	Merton silt loam, 1 to 6 percent slopes
8B	Sparta loamy fine sand, 1 to 6 percent slopes	378	Maxfield silty clay loam
12C	Emmert very gravelly sandy loam, 3 to 15 percent slopes	382B	Blooming silt loam, 1 to 6 percent slopes
27A	Dickinson sandy loam, 0 to 2 percent slopes	408	Faxon silty clay loam
27B	Dickinson sandy loam, 2 to 6 percent slopes	409B	Etter fine sandy loam, 2 to 6 percent slopes
39A	Wadena loam, 0 to 2 percent slopes	409C	Etter fine sandy loam, 6 to 12 percent slopes
39B	Wadena loam, 2 to 6 percent slopes	411A	Waukegan silt loam, 0 to 1 percent slopes
39B2	Wadena loam, 2 to 6 percent slopes, eroded	411B	Waukegan silt loam, 1 to 6 percent slopes
39C	Wadena loam, 6 to 12 percent slopes	411C	Waukegan silt loam, 6 to 12 percent slopes
39C2	Wadena loam, 6 to 12 percent slopes, eroded	414	Hamel silt loam
39D	Wadena loam, 12 to 18 percent slopes	415A	Kanaranzi loam, 0 to 2 percent slopes
41A	Estherville sandy loam, 0 to 2 percent slopes	415B	Kanaranzi loam, 2 to 6 percent slopes
41B	Estherville sandy loam, 2 to 6 percent slopes	415C	Kanaranzi loam, 6 to 12 percent slopes
42C	Salida gravelly coarse sandy loam, 2 to 12 percent slopes	449B	Crystal Lake silt loam, 1 to 8 percent slopes
49B	Aniga silt loam, 1 to 8 percent slopes	454B	Mahtomedi loamy sand, 3 to 8 percent slopes
81B	Boone loamy fine sand, 2 to 6 percent slopes	454C	Mahtomedi loamy sand, 8 to 15 percent slopes
81C	Boone loamy fine sand, 6 to 12 percent slopes	454E	Mahtomedi loamy sand, 15 to 25 percent slopes
81E	Boone loamy fine sand, 12 to 40 percent slopes	463	Minneiska loam, occasionally flooded
94C	Terril loam, 4 to 12 percent slopes	465	Kelmarville sandy loam, frequently flooded
98	Colo silt loam, occasionally flooded	495	Zumbro fine sandy loam
100A	Copaston loam, 0 to 2 percent slopes	522	Boots muck
100B	Copaston loam, 2 to 6 percent slopes	539	Palmus muck
100C	Copaston loam, 6 to 12 percent slopes	540	Seelyville muck
106B	Lester loam, 2 to 6 percent slopes	545	Rondeau muck
106C	Lester loam, 6 to 12 percent slopes	611C	Hawick coarse sandy loam, 6 to 12 percent slopes
106C2	Lester loam, 6 to 12 percent slopes, eroded	611D	Hawick coarse sandy loam, 12 to 18 percent slopes
106D2	Lester loam, 12 to 18 percent slopes, eroded	611E	Hawick loamy sand, 18 to 25 percent slopes
109	Cordova silty clay loam	611F	Hawick loamy sand, 25 to 50 percent slopes
113	Webster clay loam	857A	Urban land-Waukegan complex, 0 to 1 percent slopes
114	Glencoe silty clay loam	857B	Urban land-Waukegan complex, 1 to 8 percent slopes
124	Cylinder loam	858C	Urban land-Chetek complex, 1 to 15 percent slopes
150B	Spencer silt loam, 2 to 6 percent slopes	860C	Urban land-Lester complex, 3 to 15 percent slopes
151C	Burkhardt sandy loam, 6 to 12 percent slopes	861C	Urban land-Kingsley complex, 3 to 15 percent slopes
151D	Burkhardt sandy loam, 12 to 18 percent slopes	861E	Urban land-Kingsley complex, 15 to 25 percent slopes
155B	Chetek sandy loam, 3 to 8 percent slopes	865B	Urban land-Hubbard complex, 0 to 6 percent slopes
156C	Chetek sandy loam, 8 to 15 percent slopes	880F	Brodale-Rock outcrop complex, 18 to 45 percent slopes
155E	Chetek sandy loam, 15 to 25 percent slopes	888B	Kingsley-Lester complex, 2 to 6 percent slopes
173F	Frontenac loam, 25 to 40 percent slopes	888C	Kingsley-Lester complex, 6 to 12 percent slopes
176	Garwin silty clay loam	888D	Kingsley-Lester complex, 12 to 18 percent slopes
177A	Gotham loamy fine sand, 0 to 2 percent slopes	889B	Wadena-Hawick complex, 2 to 6 percent slopes
177B	Gotham loamy fine sand, 2 to 6 percent slopes	889C	Wadena-Hawick complex, 6 to 12 percent slopes
177C	Gotham loamy fine sand, 6 to 12 percent slopes	889D	Wadena-Hawick complex, 12 to 18 percent slopes
189	Auburn date silt loam	895B	Kingsley-Mahtomedi-Spencer complex, 3 to 8 percent slopes
203B	Joy silt loam, 1 to 5 percent slopes	895C	Kingsley-Mahtomedi-Spencer complex, 8 to 15 percent slopes
208	Kato silty clay loam	896E	Kingsley-Mahtomedi complex, 15 to 25 percent slopes
213B	Klinger silt loam, 1 to 5 percent slopes	896F	Kingsley-Mahtomedi complex, 25 to 40 percent slopes
226	Lawson silt loam	963C2	Timula-Bold silt loams, 6 to 12 percent slopes, eroded
239	Le Sueur loam	963D2	Timula-Bold silt loams, 12 to 18 percent slopes, eroded
250	Kennebec silt loam	963E2	Timula-Bold silt loams, 18 to 25 percent slopes, eroded
251D	Marlean loam, 12 to 18 percent slopes	1013	Pits, quarry
251E	Marlean loam, 18 to 25 percent slopes	1027	Udorthents, wet
252	Marshan silty clay loam	1029	Pits, gravel
253	Maxcreek silty clay loam	1039	Urban land
255	Mayer silt loam	1055	Aquolls and Histosols, ponded
279B	Otterholt silt loam, 1 to 6 percent slopes	1072	Udorthents, moderately shallow
279C	Otterholt silt loam, 6 to 15 percent slopes	1815	Zumbro loamy fine sand
283A	Plainfield loamy sand, 0 to 2 percent slopes	1816	Kennebec Variant silt loam
283B	Plainfield loamy sand, 2 to 6 percent slopes	1821	Alganssee sandy loam, occasionally flooded
283D	Plainfield loamy sand, 6 to 18 percent slopes	1824	Quam silt loam, ponded
285A	Port Byron silt loam, 0 to 2 percent slopes	1825C	Seelyville muck, sloping
285B	Port Byron silt loam, 2 to 6 percent slopes	1827A	Waukegan silt loam, bedrock substratum, 0 to 2 percent slopes
285C	Port Byron silt loam, 6 to 12 percent slopes	1827B	Waukegan silt loam, bedrock substratum, 2 to 6 percent slopes
299A	Rockton loam, 0 to 2 percent slopes	1827C	Waukegan silt loam, bedrock substratum, 6 to 12 percent slopes
299B	Rockton loam, 2 to 6 percent slopes	1848B	Sparta loamy sand, bedrock substratum, 2 to 8 percent slopes
299C	Rockton loam, 6 to 12 percent slopes	1894B	Winnabago loam, 2 to 6 percent slopes
301B	Lindstrom silt loam, 1 to 4 percent slopes	1895B	Carmi loam, 2 to 8 percent slopes
313	Spillville loam, occasionally flooded	1896B	Ostrander-Carmi loams, 2 to 6 percent slopes
317	Oshawa silty clay loam	1898F	Etter-Brodale complex, 25 to 60 percent slopes
318	Mayer loam, swales	1902B	Jewett silt loam, 1 to 6 percent slopes
320B	Tallula silt loam, 2 to 6 percent slopes		

Operator/Producer Joe Farmer

Planning Year 2002

Date Printed Jan 29, 2002

## Soil Information

Field	Soil Texture	Soil Map Unit and Name	Date Sampled	Organic Matter	pH	Buffer pH	P ppm	K ppm	Other Nutrient	ppm	Soil Nitrate Nitrogen		
											Date Sampled	NO3 lbs/acre	NO3 PPM
Home T558													
1	Loam	1895B Carmi	10/22/99	3.6	6.6		78 (B1)	221					
2	Silty clay loam	252 Marshan	10/22/99	4.1	6.3		23 (B1)	188					
3	Loam	39B Wadena	10/22/99	3.7	6.5		17 (B1)	148					
4	Loam	1895B Carmi	10/12/00	3.4	6.6		82 (B1)	206					
5	Loam	129 Cylinder	10/12/00	3.8	6.4		17 (B1)	121					
6	Silty clay loam	252 Marshan	10/12/00	4.2	6.3		14 (B1)	108					
7	Loam	39B Wadena	10/18/01	3.2	6.8		19 (B1)	126					
Raddle T978													
East 47	Loam	1896B Ostr-Ca	10/22/01	3.4	6.2		17 (B1)	122					
NE 17	Loam	1896B Ostr-Ca	10/22/01	3.6	6.2		14 (B1)	119					
South 36	Loam	2C Ostrander	10/22/01	3.5	6.4		23 (B1)	147					
West 38	Loam	1896B Ostr-Ca	10/22/01	3.7	6.2		19 (B1)	141					
Ricke T1157													
North 40	Sandy loam	41B Estherville	10/18/01	2.7	6.1		14 (B1)	112					
South 40	Sandy loam	27B Dickinson	10/18/01	2.5	6.3		17 (B1)	98					

# Manure Storage, Handling & Testing

## Manure & Crop Nutrient Calculator

January 29, 2002

Joe Farmer

### Building 1

#### Livestock Information

Grow-finish pig 800 @ 165 lbs.

#### Manure Storage

Storage Underfloor liquid storage  
Capacity 350000  
Storage 270

#### Application Methods

Handling Liquid  
Commercial Hauler: No  
Spreader Type: Slurry spreader  
Calibrated: Yes  
Calibration Volume in spreader load  
First App Method: Knife Inject  
First App Timing: Fall (Oct - Dec)  
Second App Method: Broadcast-Inc. 12-96 hrs  
Second App Timing: Spring (Apr - Jun)

#### Manure Analysis

Sampling Frequency: Annually  
Sampling Method: From spreader after loading, well agitated

Date Analyzed: 11/2/2001  
N (lbs./ton or 1000 gal): 47.2  
P2O5 (lbs./ton or 1000 gal): 35.8  
K2O (lbs./ton or 1000 gal): 29.9

#### Annual Manure/Nutrients Generated

Estimated Volume: 1 348480 gallon  
Measured Volume: 420000 gallon  
Total N (lbs): 2 19824  
Total P2O5 (lbs): 2 15036  
Total K2O (lbs): 2 12558

### Building 2

#### Livestock Information

Grow-finish pig (wet/dry feeder) 800 @ 165 lbs.

#### Manure Storage

Storage Underfloor liquid storage  
Capacity 350000  
Storage 365

#### Application Methods

Handling Liquid  
Commercial Hauler: No  
Spreader Type: Slurry spreader  
Calibrated: Yes  
Calibration Volume in spreader load  
First App Method: Knife Inject  
First App Timing: Fall (Oct - Dec)  
Second App Method:  
Second App Timing:

#### Manure Analysis

Sampling Frequency: Annually  
Sampling Method: From spreader after loading, well agitated

Date Analyzed:  
N (lbs./ton or 1000 gal):  
P2O5 (lbs./ton or 1000 gal):  
K2O (lbs./ton or 1000 gal):

#### Annual Manure/Nutrients Generated

Estimated Volume: 1 261360 gallon  
Measured Volume: gallon  
Total N (lbs): 2 13939  
Total P2O5 (lbs): 2 14375  
Total K2O (lbs): 2 8712

1. Estimated volume does not include dilution from bedding or water.
2. Total N, P2O5 and K2O from manure after accounting for storage losses.



# Manure Nutrient Supply

*Manure & Crop Nutrient Calculator*  
January 29, 2002

Name	Joe Farmer
Phone	(651) 000-0000

**Address**      **Any Street**  
**Any City, MN 55555**

Description	Follow-up plan after construction of a new 800 head swine finishing building with 350,000 gallons under-floor liquid manure storage.
-------------	--

Livestock operation now consists of two 800 head swine finishing buildings with each having 350,000 gallons of storage. Land receiving manure consists of 424 acres planted to 50/50 corn/soybean rotation.

## Manure Sources

Manure Storage	Storage Type	Primary Application Method	Primary Application Percent	Secondary Application Method	Secondary Application Percent	Annual Measured	Volume Units	Test Analysis Total N	Test Analysis P <sub>2</sub> O <sub>5</sub>	Test Analysis K <sub>2</sub> O	Analysis Units
Building 1	Underfloor liquid storage	Knife Inject	75%	Broadcast-Inc 12-96 hrs	25%	420000	gallons	47.2	35.8	29.9	lbs/1000gal
Building 2	Underfloor liquid storage	Knife Inject	100%				gallons				lbs/1000gal

## Livestock

Animal Type	Average Weight	Number of Animals	Number of Days	Percent Manure Collected	Where is Manure Stored?	<u>Estimated</u> Nutrients Produced By Livestock (lbs)		
						N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Grow-finish pig	165	800	330	100%	Building 1	16117	13068	9583
Grow-finish pig (wet/dry feeder)	165	800	330	100%	Building 2	17424	14375	8712
Total <u>Estimated</u> Nutrients From All Livestock (before storage losses)						33541	27443	18295

**Totals**

Manure Storage	Storage Type	Annual <u>Estimated</u> After Storage Losses (lbs)			Annual <u>Measured</u> After Storage Losses (lbs)			Annual Total After Storage and Application Losses (lbs)		
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Building 1	Underfloor liquid storage	12894	13068	9583	19824	15036	12558	17346	12029	11302
Building 2	Underfloor liquid storage	13939	14375	8712				12545	11500	7841
Total Annual N After Storage and Application Losses, and Total Annual P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> O (first year availability basis)								29891	23529	19143

## Manure & Crop Nutrient Calculator

**January 29, 2002**

**Name**       **Joe Farmer**

Address	Any Street
---------	------------

**Any City, MN 55555**

Description	Follow-up plan after construction of a new 800 head swine finishing building with 350,000 gallons under-floor liquid manure storage. Livestock operation now consists of two 800 head swine finishing buildings with each having 350,000 gallons of storage. <u>Land receiving manure consists of 424 acres planted to 50/50 corn/soybean rotation.</u>
-------------	---

## Crops

Designated Crop	Previous Crop (1 Year Ago)	Previous Crop (2 Years Ago)	Acres	Designated Crop Expected Yield	Units	Soil Organic Matter Level
Corn	Soybeans	Corn	212	165	bushels	Med-High (>=3.0%)
Soybeans	Corn	Soybeans	212	50	bushels	Med-High (>=3.0%)
		Total Acres	424			

## Nutrient Needs

Designated Crop	Previous Crop (1 Year Ago)	Previous Crop (2 Years Ago)	Acres	Annual Nitrogen Demand		Annual Phosphate Removal	Annual Potash Removal
				UM Recommended lbs	Crop Removal lbs	lbs	lbs
Corn	Soybeans	Corn	212	25652		11872	6572
Soybeans	Corn	Soybeans	212		37100	8692	10600
		Total Acres	424				
			Total Recommended N (lbs)	Total Removal N (lbs)			
			25652	37100			
				Nitrogen	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
			Total Annual Nutrient Demand For The Crop Rotation (lbs)	62752	20564	17172	
			Per Acre Average Crop Nutrient Demand For The Crop Rotation (lbs)	148	49	41	

Note:

The rotational average calculations for the “Crop Nutrient Demand” and “Nutrient Summary” reports assume application of manure to both legumes (soybeans in this example plan) and non-legumes (corn in this example). This is not generally a preferred practice, but is used to determine the minimum acres needed to meet state feedlot rules for the operation. Efficient use of nitrogen and prevention of phosphorus buildup in the soil would usually emphasize application of manure to non-legumes only in the rotation. The “Annual Crop Nutrient Plan” section contains the actual field specific manure and fertilizer nutrient rates to be applied.

## Nutrient Summary

## Manure & Crop Nutrient Calculator

**January 29, 2002**

**Any City , MN 55555**

## Manure Spreader Calibration Calculation

Example: Liquid Manure, Calibration by Weight Using Five Load Cells,  
Average of Three Tank Loads

Producer: Joe Farmer  
 Date: 11/3/01  
 Calibrated by: Jim Consultant  
 Fields applied: Home Farm (T558) 2,3,4,6  
 Type of storage: Under-floor, liquid  
 Application method: Knife injected  
 Spreader type: Tank

### Volume of manure per load

	Empty Weight, (lbs)	Full Weight (lbs)		
Load Cell Location		Tank Load 1	Tank Load 2	Tank Load 3
Wheel 1	1145	5775	6080	5705
Wheel 2	1135	5980	6140	5875
Wheel 3	1215	5870	5980	5945
Wheel 4	1205	5730	6045	5995
Tongue Jack	1235	6805	7025	6965
<b>Total</b>	<b>5935</b>	<b>30160</b>	<b>31270</b>	<b>30485</b>
Empty Spreader Weight		5935	5935	5935
<b><u>Manure Weight</u></b>		<b>24225</b>	<b>25335</b>	<b>24550</b>
<b><u>Manure Volume (gallons)</u></b>		<b>2908</b>	<b>3041</b>	<b>2947</b>

Average volume of manure per load: 24703 lbs, or 2966 gallons

### Area covered per load

Length of Run: 3375 feet  
 Spread width: 10 feet  
 Total area per load: 33750 sq. ft. or 0.775 acres

### APPLICATION RATE

Tank Load	1	2	3	Average
Application Rate (gal/acre)	3753	3925	3804	<b>3828</b>

## Manure Spreader Calibration Calculation

Example: Liquid Manure, Calibration by Volume

Producer: Joe Farmer  
Date: 4/26/02  
Calibrated by: Jim Consultant  
Fields applied: T978 Northeast 17  
Type of storage: Under-floor, liquid  
Application method: Surface broadcast, incorporated in less than 5 days  
Spreader type: Tank

### Volume of manure per load

Known capacity of tank: 3250 gallons

Estimated volume of manure in spreader: 2925 gallons (90% of spreader capacity)

### Area covered per load

Length of Run: 1715 feet  
Spread width: 14 feet  
Total area per load: 24010 sq. ft. or 0.551 acres

### APPLICATION RATE

5307 gallons per acre

## SOIL SAMPLING



Economic fertilizer recommendations should be developed based on analysis of properly sampled soil. This fact sheet focuses on soil sampling and soil testing laboratories.

### Soil Sampling Procedures

Soil test results are no better than the samples collected. Proper soil sampling techniques are critical to determine the average nutrient status in a field as well as the nutrient variability across a field. Fertilizer recommendations based on samples not representative of a field may result in over-application and/or under-application of nutrients. This can have a negative impact on both economics and the environment.

The Natural Resources Conservation Service (NRCS) requires producers to test their soil every 4 years. These analyses will include pH, organic matter, phosphorus and potassium. Producers are also encouraged to test for soil nitrate levels, when applicable.

**The first step** is to determine the number of samples needed per field. This is dependent upon the amount of variability within the field. Factors that should be considered include soil types and textures, slopes, cropping history, manure history, drainage, and erosion. Each sample is comprised of 15-20 cores. A core is an individual boring or coring at one spot in the field.

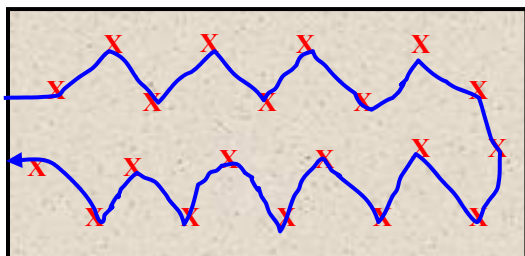
Ideally, large uniform fields should have 1 composite sample collected per 20 acres or less. Smaller fields, including contour strips, should have 1 composite sample collected per 5 acres, especially on hilly or rolling ground. Separate samples should be taken from unique areas such as low spots, eroded knolls, terraces, old fence rows, lime or fertilizer spill areas, headlands and saline areas.

Fewer samples can be taken provided there is little in-field variability; the number of cores representing an individual sample is increased; or fertility management of small individual areas is not practical. In these cases, samples from larger fields and uniform landscapes may be divided into areas that are no larger than 40 acres. Smaller fields and hilly or rolling ground should be divided into uniform areas that are no larger than 20 acres.

Once you have defined your sampling areas, mark them on a map before you begin. Label them with a unique name or number. You may also want to mark the corresponding sample containers before heading into the field.

**The next step** is to properly collect the samples. Most samples should be collected after harvest. Do not sample shortly after lime, fertilizer or manure applications. Using a soil probe, soil auger or spade, collect 15-20 cores at random or in a grid pattern, making sure that the sampling area is adequately represented. Be sure to scrape any crop residue and manure off of the soil surface.

**Samples collected randomly**



**Samples collected in a grid pattern**



The cores should be collected from between the rows of row crops, except for ridge-till plantings. In a conventional tillage system, samples should be collected from the surface layer to a depth of 6 inches for all nutrients except nitrogen.

Where ridge till is used, collect core 6 inches to the side of banded fertilizer applications. In reduced and no-tillage systems, the depth sampled has a much greater impact on the soil test results because of the stratification of non-mobile nutrients and pH. Surface samples (0-6 inch) may need to be separated into 0-2 and 2-6 inch depths.

Mix cores thoroughly in a clean plastic pail to obtain an individual composite sample. Fill sample boxes or bags provided by soil labs from the pail to the fill line. A 60 -acre field with 3 sampling areas would require 15-20 cores for each of 3 composite boxed or bagged samples. All samples should be kept cool until delivered to the soil-testing lab.

Obtain and complete a laboratory soil sample information sheet before submitting samples. Typically you will be asked for sample identification information, crops to be grown, yield goals, previous crops and the tests you want conducted. Make sure the completed information is consistent with your maps and sample bags or boxes and that sample depths are also noted.

Samples for nitrate-nitrogen should be collected to a depth of 24 inches. Nitrate-nitrogen samples can be collected in Western and Northwestern Minnesota in fall (preferably after Sept. 15) or in early spring. Collect nitrate-nitrogen samples in South-Central, Southeastern and East-Central Minnesota before planting, at planting, or immediately after planting corn. Nitrate-nitrogen samples should be kept cool and shipped immediately overnight to the lab or immediately frozen and sent via normal mail. In either case, ensure that the sample does not arrive at a lab on a Saturday or Sunday.

### **Soil Test Laboratories**

For NRCS program participants, samples should only be submitted for analysis to a laboratory that participates in the Minnesota Department of Agriculture (MDA) Soil Testing Lab Certification program. A list of certified laboratories is available on-line at: <http://www.mda.state.mn.us/> by going to "MDA A to Z" and clicking on "S" and then "Soil Testing Laboratories".

Labs that participate in this program do so to ensure that their analytical methods have been collectively endorsed by midwestern universities. This significantly reduces variability from lab to lab. These labs also use the same reporting units as are used in University of Minnesota Fertilizer Recommendations such as parts per million of elemental Phosphorous (P). This reduces the risk of error that could result from developing fertilizer recommendations based on different reporting units or using different analytical procedures.

Some soil testing laboratories participating in MDA's certification program may provide crop nutrient need recommendations based on the soil test results. These recommendations may be different than the most current University of Minnesota Fertilizer Recommendations. It is important to recognize and understand these differences.

## MANURE SAMPLING AND ANALYSIS

This fact sheet was prepared by Jan Jarman, formerly with the Mn. Dept. of Agriculture.

Manure nutrients applied to cropland should be accounted for when determining commercial fertilizer needs. Manure nutrient composition varies widely between farms due to differences in animal species and management and manure storage and handling. Sampling and laboratory analysis is the only method for determining the actual nutrient content of manure. Published average values should only be used for initial application rate planning when no previous analyses are available, for estimating total nutrients generated in a specific time period, or for MPCA permitting requirements.

### WHEN TO SAMPLE

Manure is very heterogeneous and nutrients stratify in storage. Sample manure at application time following adequate agitation of liquids in storage or mixing of solids in the spreader loading process. If no previous analyses are available, use published average values for initial application rate planning, then use the analysis results to calculate commercial fertilizer needs. Sample manure each time it is applied, over the course of several applications. Track analysis results to determine the needed sampling frequency and develop farm-specific average value to use for application rate planning. Nutrient content will change with changes in management (housing, feed, bedding, storage, handling) and can vary between years or seasons depending on precipitation (for manure stored outdoors).

### WHAT TO SAMPLE

Agitated liquid slurries: Agitate liquid in entire structure for 2-4 hours just prior to application. Take one sample per 300,000 gallons of pumped manure. Avoid sampling near beginning and end of pump-out. Each sample may consist of several subsamples mixed together. If it is not possible to agitate liquid slurries before application, several samples taken throughout pump-out will be needed to characterize the manure. Keep track of which sample results correspond to manure applied to which fields.

Unagitated lagoon liquids (single/multiple stage, settling basins): Lagoons, which act as settling basins or are used in flush/recycle systems, are usually not agitated. Take out sample per 300,000 gallons of pumped liquid. Avoid sampling near beginning and end of pump-out. Each sample may consist of several subsamples mixed together.

Stored solids: Depending on the size of the pack, pile or stack, take at least three samples during application, each consisting of 5-10 subsamples from different loads. More samples are needed for stored solids because of its extreme variability. Avoid sampling the outside foot of a pile or stack.

Scrape and haul: Sample when applying to fields where nutrients will be credited. Fall is probably the most important time to sample. Take several subsamples from consecutive applications and mix together. Samples may be taken throughout the year to characterize variability.

Poultry in-house systems: For litter or manure that is not stored for any length of time prior to application. Use a pitchfork or shovel to sample to the depth of the floor in 5-10 locations in each house. Mix subsamples to obtain 1 or 2 samples for analysis. Take subsamples from around feeders and waterers in proportion to the areas they occupy.

### HOW TO SAMPLE

Liquid manure: Samples can be taken in the field (for broadcast manure) or from the application equipment. Sampling in the field can be done by placing catch cans throughout the area where manure will be spread. Mix the subsamples in a bucket and take a smaller sample for analysis. Sampling from the application equipment is the easiest and most effective way to get a good sample. Take subsamples from the filling hose or from a bottom unloading port, mix together in a bucket and take a sample for analysis. Sampling from liquid storage structures is not recommended since it is much safer and easier to sample from application equipment or in the field.



**Solid manure:** Samples can be taken in the field or from the spreader. In the field, spread tarps to catch manure as it is applied. For each sample, take several small subsamples from the tarps and place in a bucket or pile. Avoid larger pieces or chunks of bedding. Collect other subsamples throughout application and keep cool. Subsamples can be mixed by placing in a pile and repeatedly shoveling the outside of the pile to the inside. Use a trowel or plastic gloves to take a smaller sample for analysis. Samples can also be taken with a pitchfork or shovel from the spreader box after it is loaded. Collect subsamples throughout application, keep cool, mix and take a smaller sample for analysis. Again, sampling from the field or spreader is much easier and safer than trying to sample from a pack or pile.

## SAMPLE HANDLING AND ANALYSIS

**Laboratories:** A listing of manure testing laboratories is available from the Minnesota Department of Agriculture Manure Testing Laboratory Certification Program, (612) 297-2530.

**Preparing samples:** For liquids and solids, clean, leakproof plastic jars with wide mouths may be used for the samples. Solids with lower water content can also be placed in leakproof plastic ziplock bags. Most laboratories will provide sample jars and postpaid mailing packages. Jars should be filled no more than  $2/3 - 3/4$  full, tightly sealed and placed in a leakproof plastic bag. For solids, plastic bags can be partially filled and all the air squeezed out. Fill the sample container with about 1-2 cups or 1-2 pounds (a large handful) of manure for analysis. Tightly seal containers and label with the farmer's last name and a sample ID using a waterproof marker. Place in a second plastic bag and freeze overnight if possible. Do not let samples sit in the sun or at room temperature for more than 12 hours. Mail samples early in the week and avoid weekends and holidays. Be sure to include payment and the sample information sheet.

**Analyses:** Analyses needed for developing a manure application plan are total nitrogen (N), phosphate ( $P_2O_5$ ) and potash ( $K_2O$ ). Laboratories usually provide these analyses plus dry matter (solids) and sometimes ammonium-N ( $NH_4-N$ ) for a set fee. Knowing  $NH_4-N$  can be useful if this fraction makes up a large percentage of the total N in the manure. All of the  $NH_4-N$  is usually available the first year of application. If this fraction is high (70% or more of total N), then total N availability the first year may be higher than average. It is usually not necessary to analyze manure for other mineral constituents such as calcium, magnesium, zinc, sulfur or boron. Most manures contain significant quantities of these minerals, and fields with manure histories are rarely deficient.

**Results:** Manure nutrient content should be reported in units of lbs/ton or lbs/1000 gallons, on an as-is basis. Phosphate and potash should be reported as such, rather than as P and K. A table of conversion factors is given below. Always check results to make sure they fall within normal ranges for that particular species and storage system. Use University of Minnesota nutrient availability factors to calculate total available nutrients applied.

### CONVERSION FACTORS

To convert Column 1 into Column 2, multiply by		To convert Column 2 into Column 1, multiply by	
	Column 1	Column 2	
10,000	percent (%)	parts per million (ppm)	0.0001
% DM / 100	%, DM basis	%, as-is basis	100 / % DM
83.3	%, as-is basis	lbs/1000 gal	0.012
20	%, as-is basis	lbs/ton	0.05
2.29	P, any unit	$P_2O_5$ , any unit	0.44
1.2	K, any unit	$K_2O$ , any unit	0.83

## Manure and Wastewater Storage and Handling - Record Keeping

Name: \_\_\_\_\_

Type and Number of Animals	Date _____	Date _____	Date _____	Date _____	Date _____	Date _____
1.	#	#	#	#	#	#
2.	#	#	#	#	#	#
3.	#	#	#	#	#	#
4.	#	#	#	#	#	#
5.	#	#	#	#	#	#
6.	#	#	#	#	#	#

Type Manure or Waste Removed and Applied to Fields	Date	Amt.	Date	Amt.	Date	Amt.	Date	Amt.	Date	Amt.	Total Amount
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											

Type of Manure Transported Off the Farm	Where	Date	Amount	Where	Date	Amount	Where	Date	Amount
1.									
2.									
3.									
4.									
5.									

Other information and comments:

## Fertilizer and Manure Application Record

Name: \_\_\_\_\_

[illegible]

Other information and comments:

